

**FUGITIVE DUST CONTROL
AND AIR MONITORING PLAN
FOR REMOVAL ACTIONS
YERINGTON MINE SITE**

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LIST OF ACRONYMS AND ABBREVIATIONS

ACCU	Automatic Cartridge Collection Unit	%	percent
		°C	degrees Centigrade
AIHA	American Industrial Hygiene Association	°F	degrees Fahrenheit
		µg	microgram
AQM	Air Quality Monitoring	µg/m ³	micrograms per cubic meter
ARC	Atlantic Richfield Corporation	ft	foot / feet
BMP	Best Management Practices	hr	hour
DAC	Derived Air Concentrations	kJ/m ²	kiloJoules per square meter
DQO	Data Quality Objectives	L	liter
DSR	Data Summary Report	m/s	meters per second
EDD	Electronic Data Deliverable	mBar	milliBars
ESI	Environmental Standards Inc.	min	minute
EPA	U.S. Environmental Protection Agency	Min	minute
		mm	millimeter
ICP	Inductively Coupled Plasma Instrumentation	mph	miles per hour
		pCi/L	picoCuries per liter
ICP/MS	Inductively Coupled Plasma/Mass Spectrometry Instrumentation	rem	roentgen equivalent man
MCE	Mixed Cellulose Ester		
NIST	National Institute of Standards and Technologies		
NOAA	National Weather Service hourly forecast		
OSHA	Occupational Safety and Health Administration		
QAPP	Quality Assurance Project Plan		
QC	Quality Control		
Site	Yerington Mine Site in Yerington, Nevada		
SOP	Standard Operating Procedures		
TEM	Transmission Electron Microscopy		
TEOM	Tapered Element Oscillating Microbalance		
V	Volt		
WRCC	Western Region Climate Center		
XRF	X-Ray Fluorescence Spectroscopy		

SECTION 1.0 INTRODUCTION

This Plan provides a summary of fugitive dust control measures, best management practices (BMPs), and associated air quality monitoring to be implemented during an interim or final removal action conducted by Atlantic Richfield Corporation (ARC) at the Yerington Mine Site in Yerington, Nevada (Site). The purpose of this Plan is to establish a common understanding between the on-site ARC construction manager representative (Construction Manager), the on-site construction contractor representative (Contractor), and the on-site U.S. Environmental Protection Agency (EPA) representative on how construction-related fugitive dust will be addressed at the Site during a removal action. The Plan is intended to provide general guidelines for fugitive dust control and air monitoring during removal actions at the Site, with specific details to be provided as an attachment for an upcoming removal action. The following sections describe the objectives of the plan, Site conditions, potential construction-related dust sources, BMPs, and training.

1.1 Objectives

The objectives of fugitive dust control measures to be conducted during a removal action are to:

- Avoid or minimize the generation of dust due to construction activity; and
- Prevent the migration of Site materials, primarily via the fugitive dust pathway.

The objectives of the air quality monitoring to be conducted during a removal action are to:

- Evaluate the effectiveness of fugitive dust control measures;
- Establish a notification procedure to the Contractor for when fugitive dust control measures should be increased or when construction practices should be modified; and
- Document concentrations of target analytes at the project work areas and Site perimeter.

1.2 Site Conditions

The Site encompasses approximately 3,600 acres of land in a high desert environment characterized by an arid climate. The Site is located about 0.5 mile west and northwest of the City of Yerington in Lyon County, Nevada (Figure 1-1). Mining and ore processing activities at the Site have resulted in modifications to the natural, pre-mining topography including a large open pit (occupied by a pit lake), waste rock and leached ore piles, and evaporation and tailings ponds (Figure 1-2). The following Site conditions are summarized from the *Conceptual Site Model, Revision 3* (Brown and Caldwell, 2009a) and the *Air Quality Monitoring Program Data Summary Report, Revision 2* (Brown and Caldwell, 2009b). The AQM Program was conducted for approximately 3 years from January 2005 through March 2008.

- Climate: Monthly average temperatures range from the low 30s °F in December to the mid 70s °F in July. Annual average precipitation for the City of Yerington is 5.3 inches per year, with the lowest precipitation occurring between July and September (WRCC, 2007).
- Wind Speed and Direction: During the 3-year AQM Program, Site wind speed ranged from 0.0 to 52.5 miles per hour (mph) with the highest average monthly wind speeds typically occurring during the months of April, May, and June. About 65 percent of all measurements were less than 5 mph and 85 percent were less than 10 mph (Figure 1-3). Wind speed in excess of 20 mph represented less than 4 percent of all measurements. Although wind direction at the Site is typically variable, wind is most likely to blow either from the southwest to the northeast or in the opposite direction, from the northeast to the southwest (Figure 1-4). When wind speed exceeds 20 mph, the predominant Site wind direction is from the southwest to the northeast.
- Dust Events: Base on visual observations by neighboring residents and data collected during the 3-year AQM Program, about five “dust events” per year occur at the Site. The dust events in the area of the Site typically occur over short time intervals (i.e., one to several hours duration) as a result of high wind speed (i.e., greater than 20 mph). Analysis of dust events, defined as hourly PM₁₀ greater than 300 micrograms per cubic meter (µg/m³) at AM-6, during 2007 indicated that high wind speed (i.e., greater than 20 mph) alone was not sufficient to predict elevated dust levels at the Site; a second contributing factor was likely dry conditions (i.e., no precipitation at the Site for more than 10 days prior to a dust event).

1.3 Potential Construction-Related Dust Sources

Construction-related activities that have the potential to generate fugitive dust include the following:

- Site preparation activities such as grubbing, staging of materials, and demolition of structures;
- Earthwork activities such as excavating, loading/unloading, stockpiling, compacting, and grading;
- Wind erosion of project materials from borrow areas, excavations, stockpiles, and capped areas; and
- Vehicle transportation on haul roads.

1.4 Best Management Practices

ARC will be responsible for implementing the following BMPs to avoid or minimize the generation of fugitive dust during the removal action:

- Identifying a Site coordinator (typically the Construction Manager) responsible for ensuring Contractor compliance with this Plan;
- Ensuring that this Plan is available on-site throughout construction at ARC's field office;
- Ensuring that construction-related Contractor personnel are properly trained on the requirements for fugitive dust control described in this Plan;
- Ensuring the necessary labor and equipment are provided to implement the dust control measures described in this plan;
- Establishing and enforcing a notification procedure for Site conditions involving excessive dust levels or wind speed; and
- Documenting compliance with this Plan through field observation, field measurement, and laboratory analysis and reporting results to the EPA.

1.5 Personnel Responsibilities and Communication

Table 1-1 summarizes the personnel that will be implementing or auditing the work specified in this Plan. Personnel responsibilities and communication between personnel are identified.

Table 1-1. Summary of Personnel Responsibilities and Communication	
Personnel	Responsibilities and Communication
ARC Construction Manager	Implements BMPs and verifies that the Contractor implements fugitive dust control measures. Primary contact for EPA and Contractor regarding fugitive dust control and air monitoring issues. Notifies Contractor/EPA if Notification Levels are exceeded.
Contractor	Implements fugitive dust control measures and assist ARC with implementing BMPs.
On-Site EPA Representative	Confers with Construction Manager and Contractor when Notification Level 3 is exceeded.
Air Monitoring Specialist	Experience with operating equipment specified in this Plan and with implementing air monitoring efforts similar in scope.
Certified Health Physicist	Reviews this Plan and radiation exposure results.
Certified Industrial Hygienist	Reviews this Plan and asbestos exposure results.
Air Sampling Technician(s)	Experience with operating equipment specified in this Plan. Asbestos certified (for removal actions involving transite pipe and other asbestos containing material)
Data Manager	Downloads field/laboratory data into project database. Verifies/validates data per QAPP. Prepares weekly data summary packages for delivery to EPA.

1.6 Training

Construction-related Contractor personnel will attend a fugitive dust control training program that will include a discussion of the requirements of this Plan. The training will emphasize Site personnel responsibilities, dust control measures, conditions that result in modifying or stopping work, and the notification system. The training will be completed prior to the start of construction (i.e., earthwork) activities.

1.7 Document Organization

Section 2.0 describes the measures that the Contractor will employ to control fugitive dust that may be generated from construction activities. Section 3.0 describes the data quality objectives (DQOs) that will be used to ensure data of sufficient quality are collected to evaluate the effectiveness of the fugitive dust control measures. Section 4.0 describes air monitoring equipment and sampling parameters, while Section 5.0 describes the analytical methods. The information in these sections is based on the *Air Quality Monitoring Work Plan, Revision 2* (Brown and Caldwell, 2009b) which was used to conduct the 3-year AQM Program. Section 6.0 provides the quality assurance plan, and Section 7.0 describes how data will be managed and reported. Section 8.0 provides references used in this Plan.

SECTION 2.0

FUGITIVE DUST CONTROL MEASURES

The Contractor will implement fugitive dust control measures as necessary to avoid or minimize the generation of fugitive dust throughout the construction period of the removal action. Dust control measures will be available throughout the construction period, as necessary, in construction project areas where significant dust generation becomes a safety or air quality issue. Fugitive dust controls measures that may be implemented include the following:

- Applying water or dust suppressants, palliatives, and/or entrainment materials to disturbed surfaces and other fugitive dust sources;
- Covering or wetting stockpiles;
- Paving of roadways;
- Removing materials promptly from the site likely to give rise to airborne dusts;
- Curtailing certain activities during periods of high wind conditions;
- Reseeding and replanting disturbed areas to establish effective vegetative cover;
- Placing rumble plates or rock at exits to the Limit of Work;
- Minimizing vehicle speed on haul roads;
- Covering or wetting of material in open bodied haul trucks likely to give rise to airborne dusts; and
- Tarping, dry-brushing, or cleaning vehicles.

Primary fugitive dust control measures are discussed in more detail below.

2.1 Application of Water

The application of water to project work areas will be a primary fugitive dust control measure. Water may be applied to roads and disturbed areas such as borrow areas, excavations, material transfer points, and capping areas. The Contractor will operate a sufficient quantity of water trucks throughout the project, as necessary. If the water trucks cannot control fugitive dust, the Contractor will implement additional control measures.

2.2 Application of Dust Palliatives

Dust suppressants, palliatives, and/or entrainment materials may be used on project work areas to reduce or eliminate the potential for fugitive dust. The Contractor must submit information on the proposed dust palliative for approval by the Construction Manager and the on-site EPA representative prior to use at the Site. The information to be provided includes material specifications (manufacturer, brand name, composition, etc.), amount to be used (volume, rates of application, surface area to be covered, etc.), and handling/distribution methods.

2.3 Wind Speed Restriction

To prevent Site construction activities from contributing to a possible dust event, a wind speed restriction on construction activity will be implemented during the removal action as a BMP. If the 15-minute average wind speed at AM-6 exceeds 25 mph, the Construction Manager will notify the Contractor to stop work temporarily until wind speed falls below this level (i.e., until a subsequent 15-minute average wind speed is 25 mph or lower).

2.4 Vehicle Speed Limit Restriction

Hauling on unpaved Site roads has the potential to generate fugitive dust, even with the application of water to road surfaces. To minimize this potential, the on-site speed limit for construction vehicles will be limited to 25 mph. The Traffic Control Plan and contract drawings may have additional restrictions on vehicle speed for the Contractor to comply with.

2.5 Materials Storage and Handling

The Contractor will not handle or store any material in a manner that results in excessive generation of dust. Topsoil and subsoil storage piles maintained as a part of a removal action will be sufficiently wetted down or covered to reduce wind-blown dust. This may involve the use of a light soil tackifier or adequate wetting of the soil pile surface to produce a crust that is less prone to wind erosion. Screening operations will control dust emissions by use of a water truck, conducting padding operations during less windy periods, or other suitable control measures.

Any vehicle operating on a paved roadway with a load of dirt, sand, gravel, or other material susceptible to being dropped, spilled, leaked, or generating dust would implement one or more the following control measures:

- Use tarps or similar cargo covers to prevent the generation of airborne dust and keep material from escaping;
- Keep the highest portion of the load 6 inches or more below the lowest part of the rim of the truck bed; and
- Keep the materials sufficiently damp to control dust emissions during transportation.

2.6 Paved Road Crossings

At paved road crossings, the Contractor will install a rock access pad on both sides of the road to reduce the amount of soil tracked onto roadways. In addition, any soil that is tracked onto adjoining paved roadways will be promptly swept or washed off the road surface as quickly as safety concerns allow. The Contractor will not wash mud or dirt off of the road into storm drain facilities unless adequate inlet sediment controls are in place.

SECTION 3.0

DATA QUALITY OBJECTIVES

DQOs developed for this Plan, summarized in Table 3-1, are intended to ensure that reliable data are acquired for decision making. A systematic seven-step planning approach outlined in the EPA quality assurance document *Guidance on Systematic Planning Using the Data Quality Objective Process* (EPA, 2006) is used to establish performance or acceptance criteria, which serve as the basis for designing a plan for collecting data of sufficient quality and quantity. The DQO process consists of the following seven iterative steps:

- Step 1: State the Problem
- Step 2: Identify Study Goals
- Step 3: Identify Information Inputs
- Step 4: Define the Boundaries of the Study
- Step 5: Develop an Analytical Approach
- Step 6: Specify Performance or Acceptance Criteria
- Step 7: Develop the Plan for Obtaining the Data.

Table 3-1. Data Quality Objectives for Air Monitoring During Removal Actions						
Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7
Problem Statement	Identify Study Goals	Identify Information Inputs	Study Boundaries	Develop the Analytical Approach	Specify Performance or Acceptance Criteria	Develop the Plan for Obtaining Data
The Construction Manager requires a continuous assessment of construction-related airborne dust and possibly other target analytes in the project work area to verify the effectiveness of the Contractor's fugitive dust control measures.	Conduct air sampling for PM ₁₀ throughout each day of the construction period that involves earthwork such as excavation, stockpiling, loading, hauling, filling, capping, compacting, grading. If the removal action involves managing soil impacted with radiochemicals, then conduct radiochemical air sampling. If the removal action involves managing asbestos containing materials such as transite pipe, then conduct asbestos air sampling.	Monitor from at least 3 project work area stations (1 upwind and 2 downwind) during the construction day (8-10 hrs). On days when wind is variable, additional stations may be used. <ul style="list-style-type: none">PM₁₀: 15-minute average measurementsRadiochemicals: 4-hour filter sampling, twice dailyAsbestos: 8- to 10-hour filter sampling daily	Each removal action will have defined project work areas that the Contractor may operate in. These project areas will typically be within the Yerington Mine Site boundary. In addition, each removal action will have a project schedule or contract period in which the Contractor must completed the work. This information will be provided as an attachment to this Plan.	Use portable, real-time meters on tripods near the project work area. When applicable, the meters will feature real-time displays, visual/audible warning system, battery operation for at least 10 hours, and data logging.	Meters will be calibrated, maintained, and operated per manufacturer's recommendations and SOPs. Typically, each meter will be calibrated initially by the manufacturer or supplier, followed by periodic calibration verification in the field.	A specific sampling and analysis plan will be provided for each removal action as an attachment to this Plan. The attachment will include details on equipment to be used, monitoring locations, and a schedule.
Periodic assessment of air quality is required at the Site perimeter during the removal action.	Conduct high volume air sampling for PM ₁₀ and selected metals/ radiochemicals on a weekly basis. Conduct continuous PM ₁₀ monitoring and meteorological monitoring. Analyze correlations between high volume and continuous monitoring. Use meteorological data to calculate sample volumes and for upwind/downwind evaluation.	Monitor from at least 3 permanent, Site perimeter stations AM-1 through -6 (1 upwind and 2 downwind) weekly (10-hr duration) during the construction period. Measure hourly average PM ₁₀ with the continuous monitors.	Each removal action occurring within the Yerington Mine Site boundary can typically use the 3 most proximate Site perimeter stations. In addition, each removal action will have a project schedule or contract period in which the Contractor must completed the work. This information will be provided as an attachment to this Plan.	High volume PM ₁₀ equipment will sample an 8-in by 10-in quartz fiber filter which will be analyzed off-site for PM ₁₀ and selected metals/ radiochemicals. The continuous PM ₁₀ equipment (TEOM) at AM-6 has an ACCU unit that samples a 47-mm Teflon filter triggered during a dust event. The filter will be analyzed off-site for selected metals (including total radium, uranium, and thorium).	Acceptance of chemical analytical results will be based on verification and validation criteria specified in the Site-Wide QAPP - Revision 5.	A specific sampling and analysis plan will be provided for each removal action as an attachment to this Plan. The attachment will include details on equipment to be used, monitoring locations, and a schedule.

SECTION 4.0

MONITORING EQUIPMENT AND SPECIFICATIONS

A combination of project work area monitoring and Site perimeter monitoring will be conducted during a removal action. Table 4-1 summarizes the air monitoring equipment and locations that may be used during a removal action. Specific details on monitoring to be conducted for a specific removal action will be provided as an attachment to this Plan. Monitoring at the immediate project work area will be conducted typically with mobile, battery-powered meters/monitors and is designed to evaluate the effectiveness of fugitive dust control measures. Work area stations are to be defined on a project basis and provided as an attachment to this Plan. The mobile equipment can be moved as needed to upwind/downwind project work area stations based on previous, current, and forecasted wind patterns. This equipment assists the Construction Manager by providing real-time information on project work area air quality so that the Contractor may be notified promptly if additional fugitive dust control measures are needed or if work practices should be modified. Monitoring at the Site perimeter will be conducted typically with fixed monitors/instrumentation supplied with permanent electrical power.

The six permanent Site perimeter air monitoring stations, AM-1 through AM-6, are mapped on Figure 4-1. Photographs of the stations are provided in Appendix A. This equipment enables ARC to document concentrations of target analytes at the Site perimeter during the removal action. The following sections describe the equipment to be used for both Site perimeter and project work area monitoring.

Table 4-1. Air Monitoring Summary							
Activity/Parameter	Work Area Stations	Permanent Site Perimeter Stations					
		AM-1	AM-2	AM-3	AM-4	AM-5	AM-6
High Volume PM ₁₀ Sampling ⁽¹⁾		Weekly	Weekly	Weekly	Weekly	Weekly	Weekly
Continuous PM ₁₀ Monitoring ⁽¹⁾		Contin.		Contin.			Contin.
Wind Speed/Direction ⁽¹⁾		Contin.		Contin.			Contin.
Temperature/RH							Contin.
Barometric Pressure							Contin.
Solar Radiation							Contin.
Precipitation							Contin.
Real-Time PM ₁₀ Measurement	Daily						
Rad. Air Sampling ⁽²⁾	Daily						
Asbestos Air Sampling ⁽³⁾	Daily						
Portable Site Perimeter Rad. Air Sampler	Daily	Site Perimeter Downwind of Work Area (variable location)					

Notes:

- (1) For a typical removal action, 1 upwind and 2 downwind site perimeter stations will be identified for high volume PM₁₀, continuous PM₁₀, and wind speed/direction monitoring.
- (2) If the removal action involves managing soil impacted with radiochemicals, then conduct radiochemical air sampling.
- (3) If the removal action involves managing asbestos containing materials such as transite pipe, then conduct asbestos air sampling.

4.1 High Volume PM₁₀ Air Sampling

Periodic high volume PM₁₀ air sampling will be conducted concurrently with continuous PM₁₀ monitoring at the Site perimeter so that correlations of PM₁₀ and select chemicals/radiochemicals can be established. The intent is to use the continuous PM₁₀ data, which is generated 24/7 and can be spot checked by the Construction Manager at any time, as a surrogate for concentrations of target analytes at the Site perimeter during the removal action.

One high volume PM₁₀ air sampler is located at each permanent Site perimeter air monitoring station AM-1 through AM-6. Off-site locations AM-1, AM-2, and AM-3 have security fencing to protect the equipment. One additional high volume PM₁₀ air sampler (AM-1 DUP) is located at AM-1 for duplicate (i.e., collocated) air samples. Tisch Environmental, Inc. manufactures the TE-6070D high volume air sampler which was approved by EPA under Federal Reference Method (FRM) Number RFPS-0202-141. The high volume PM₁₀ air sampler specifications are summarized in Table 4-2 and described below.

Table 4-2. High Volume PM ₁₀ Equipment Specifications	
Manufacturer	Tisch Environmental, Inc.
Model	TE-6070D
Construction	Anodized aluminum
Filter Media	8-in by 10-in quartz fiber filter
Inlet	Size selective, vertically symmetric
Flow Rate	36 to 44 ft ³ /min
Flow Control	Mass flow controlled w/ probe
Motor Blower	2-stage vacuum, 0.6 hp
Flow Indicator	Continuous flow/pressure recorder
Timer	Digital timer/elapsed time indicator
Electrical supply	110 V, 60 Hz, 5 A

The sampler is a mass flow controlled, high volume air sampler for PM₁₀ measurements. The system components are housed in an anodized aluminum shelter that supports a size selective, vertically symmetric PM₁₀ inlet. A blower motor assembly draws air through the quartz fiber filter which is held in place by a filter paper cartridge. A combination mass flow controller with air flow probe, digital timer, and digital elapsed time indicator provides a constant flow rate and programmable operation. A continuous flow/pressure recorder verifies the sample duration and ensures the target volume is achieved. High volume PM₁₀ air sampling will be conducted prior to and during the construction period as described below.

- **Background Sampling:** A high volume PM₁₀ air sample will be collected weekly at each Site perimeter air monitoring station for at least two weeks prior to the start of earthwork activities. These “background” samples are, in essence, a temporal “spot check” of perimeter concentrations of PM₁₀ and selected metals/radiochemicals that can be compared to the typical range of results obtained during the 3-year AQM Program. Note that samples collected during the AQM Program were obtained over a 24-hour duration that includes typically calm winds at night, and a correction factor may be considered for the comparison. The comparison will be station to station (e.g., AM-6 data to AM-6 data) for typical (i.e., not during high winds or a dust events) annual, monthly and seasonal averages/standard deviations.
- **Construction Period Sampling:** A high volume PM₁₀ air sample will be collected weekly from at least three (one upwind and two downwind) Site perimeter air monitoring stations during the construction period. The day of the week that sampling occurs will be varied to avoid any biases due to regular construction activities. The background sample data

(in combination with construction period sample data and current wind speed/direction data) will be used throughout the construction period to determine if construction activities generate a noticeable increase of constituent concentrations at the Site perimeter. Construction-related effects at the Site perimeter are not expected because robust project area monitoring is specified in this Plan in combination with Notification Levels described in Section 4.7. If Notification Level 3 is exceeded at one or more stations, the frequency of high volume PM₁₀ air sampling will be increased to daily (while construction is occurring) until there are two consecutive days with no exceedance of Notification Level 3. At this point, the frequency of high volume PM₁₀ air sampling will revert back to weekly.

The sampling will be conducted in accordance with 40 CFR, Chapter I, Appendix J to Part 50, *Reference Method for the Determination of Particulate Matter as PM-10 in the Atmosphere* (EPA, 1998). The high volume air monitoring will involve collecting an integrated (i.e., continuous) air sample during construction activity anticipated to be up to 10 hours from approximately 7:00 a.m. to 5:00 p.m. on the target day. Targeted values for sample duration, flow rate, and volume for PM₁₀ samples are provided in Table 4-3, which also includes parameter variances that are allowed by the PM₁₀ method (adjusted for the shortened 10-hour sample duration).

Although the monitoring equipment has a digital timer and mass flow controller, actual sample duration and flow rate may differ from targeted values. The filters will be sent off-site for laboratory analysis of PM₁₀ and selected metals/radiochemicals. The actual detection limits achieved are dependent upon the instrument detection limit and sample volume (e.g., sample volumes less than targeted values result in higher than targeted detection limits).

Table 4-3. High Volume PM ₁₀ Sampling Specifications		
Sample Frequency	Target	Weekly
Sample Duration	Target	600 min (10 hours)
	Allowable variance	570 to 630 min (9.5 to 10.5 hours)
Sample Flow Rate	Target	40 ft ³ /min (1.13 m ³ /min)
	Allowable variance	36 to 44 ft ³ /min (1.02 to 1.24 m ³ /min)
Sample Volume	Target	24,000 ft ³ (680 m ³)

4.2 Continuous PM₁₀ Monitoring

As mentioned in Section 4.1, continuous PM₁₀ monitoring will be conducted concurrently with periodic high volume PM₁₀ air sampling. One continuous PM₁₀ monitor is located at permanent Site perimeter air monitoring stations AM-1, AM-3, and AM-6. The monitors will be operated continuously (except during brief maintenance periods) for at least one month prior to the construction period, throughout the duration of the construction period, and for at least one month following the construction period. The monitor at AM-6 may be operated for a longer period after consultation with the EPA following review of data from the 1-month post-construction period.

Thermo Electron (previously Rupprecht and Patashnick) manufactures the TEOM¹ Series 1400a Ambient Particulate Monitor which has received EPA PM₁₀ equivalency approval EQPM-1090-079. The continuous PM₁₀ monitor specifications are summarized in Table 4-4 and described below.

Each monitor is housed in a custom, air conditioned shed to provide full weather protection. The enclosure is secured to a 7-foot by 9-foot concrete pad and supplied with permanent electrical power. The TEOM inlet protrudes through the roof such that the sampling elevation is at approximately 4 meters. The monitor is composed of: ambient temperature/pressure sensors; a TEOM Sensor Unit which houses the mass transducer; connecting tubing and in-line filters; and a TEOM Control Unit which provides flow control, programmable functions, data logging, and visual display. The monitor at AM-6 features an ACCU² intelligent sampling system so that sample collection on a 47-mm Teflon filter cassette can be triggered by particulate concentration.

¹ TEOM refers to the patented Tapered Element Oscillating Microbalance technology

² ACCU refers to the Automatic Cartridge Collection Unit

Table 4-4. Continuous PM₁₀ Equipment Specifications	
Manufacturer	Thermo Electron
Model	TEOM Series 1400a
Inlet	R&P PM-10 inlet, 4 m elevation
Flow Rate	Main 3.0 L/min, auxiliary 13.7 L/min
Flow Control	Activol flow control with automatic mass flow controller and ambient temp/press sensors
Range	0 to 5,000,000 µg/m ³
Resolution/Precision	0.1 µg/m ³ , ± 1.5 µg/m ³ (1 hr)
Data Output	2 sec real time, 1 hr average
Filter Media	13 mm Pallflex TX40, 47 mm Teflon (ACCU)
Data Storage/Comm.	Data logger, Verizon wireless modem
Electrical supply	110 V, 60 Hz, 4 A

The TEOM units at AM-1, AM-3, and AM-6 will be programmed to record integrated PM₁₀ continuous measurements every hour (i.e., 1-hour PM₁₀ average values). The ACCU system for the TEOM unit at AM-6 will be programmed to collect a sample on the 47-mm Teflon filter cassette when one 1-hour average PM₁₀ concentration exceeds 300 µg/m³. The ACCU system will continue to sample as long as the 1-hour average PM₁₀ concentration exceeds 300 µg/m³. The sample flow rate is 13.67 liters per minute (L/min) and the sample duration will be set for a minimum of two hours and a maximum of eight hours. This results in a sample volume range between approximately 1,640 liters and 6,560 liters and an average target sample volume of 4,100 liters (or 4.1 m³). The filter cassette will then be analyzed at an off-site laboratory.

4.3 Meteorological Monitoring

Meteorological parameters will be monitored continuously during the removal action to interpret the air monitoring data and monitor wind patterns during the removal action. Meteorological equipment is located at permanent Site perimeter air monitoring stations AM-1, AM-3, and AM-6. Each station features a wind sensor mounted on a 10-meter tower which can be tilted down for sensor maintenance and calibration. The specifications of the meteorological equipment installed at each station (AM-1, AM-3, and AM-6) are listed below:

- RM Young 05305 Wind Monitor-AQ for measuring wind speed and direction;
- Universal UT30 10-meter tower and adjustable mast with concrete mounting base;
- Universal aluminum cross arm sensor mount;
- Campbell Scientific CR1000 measurement and control data logger, and weatherproof 16" by 18" enclosure (mounted inside the sheds);
- Campbell Scientific PS100 permanent electrical power supply with 12V charging regulator, sealed rechargeable battery, and 18V 1.2A wall charger;
- Airlink Raven 100 cellular digital modem for Verizon systems with Yagi cellular antenna; and
- Verizon data plan with static IP³ addresses for each location.

The specifications of the equipment installed solely on the more robust meteorological station at AM-6 are listed below:

- Vaisala HMP45C Temperature/ Relative Humidity probe and RM Young 12 plate gill solar radiation shield;
- Vaisala CS105 Barometric Pressure Sensor PTB101B ;
- Texas Electronics TE525WS 8-inch Rain Gage with tipping bucket (0.01 tip) and CS705 snowfall adapter with antifreeze;
- Kipp & Zonen Silicon Pyranometer (for solar radiation) mounted on the south cross arm stand with base and leveling fixture; and
- RM Young RTD4 Temperature Probe with 2- and 10- meter aspirated shields.

Meteorological monitoring will be conducted for the following parameters:

- Wind direction in degrees;
- Wind speed in meters per second (m/s);
- Temperature in degrees Celsius (°C);
- Relative humidity in percent;
- Barometric pressure in milliBars (mBar);
- Solar radiation in kiloJoules per square meter (kJ/m²); and
- Precipitation in inches.

³ IP refers to Internet Protocol

⁴ RTD refers to resistance temperature device

The data loggers at each location will be programmed to sample every 2 seconds and record data every 15 and 60 minutes (i.e., 15-minute and 1-hour averaged values). At 24-hour intervals, the data logger calculates and records summary data (e.g., sum of precipitation readings) for the previous 24 hours.

The meteorological station at AM-6 will be programmed to notify the Air Monitoring Specialist when a 15-minute average wind speed exceeds 25 mph. Each construction day, the Air Monitoring Specialist will review previous wind speed and direction information from Site meteorological stations as well as the on-line National Weather Service hourly forecast (NOAA, 2010) to identify the likely predominant wind direction for the following construction day. Based on this assessment, a minimum of one upwind and two downwind project work area stations will be identified so that at least three stations are active at any one time. This approach targets the two project work area stations that should represent the maximum downwind concentrations for each construction day.

4.4 Real-Time PM₁₀ Meter

Dust in the project work area will be measured with multiple real-time PM₁₀ meters positioned at various designated upwind/downwind project work area stations to provide prompt feedback on the effectiveness of fugitive dust control measures. The real-time PM₁₀ meters will provide 15-minute measurements on a daily basis during construction activity (anticipated to be up to 10 hours each day). The meter will be a Thermo Electron aDR-1200S Ambient Particulate Monitor (or equivalent) that features a tripod, a rechargeable battery pack, a real-time display, a data logger, a programmable PM₁₀ Notification Level (set for 500 µg/m³), and a visual/audible alarm system. The meter will be positioned approximately 2 meters above ground surface at each location. Data will be downloaded from the datalogger on a daily basis and the batteries will be recharged overnight. Data will be stored in the Site database and provided to EPA following data quality review on a weekly basis during the removal action.

4.5 Radiological Air Sampler

If the removal action activity involves the management of soil impacted with radiochemicals, then radiological air sampling at the project work area will be conducted. Radiological samples at project work area stations will be collected using an F&J Specialty Products DF-40L-Li battery-powered pump (or equivalent) operating at a minimum flow rate of 30 L/min to draw air through a 2-inch filter. Operation and calibration of the pumps will be conducted per the manufacturer specifications. The pumps are calibrated at the factory prior to shipment. The air intake will be positioned approximately 2 meters above ground surface at each location. The batteries will be recharged overnight. Samples will be collected twice a day, on days when excavation of soil impacted with radiochemicals is occurring, with a minimum sample collection time of 4 hours for each sample. The samples will be analyzed daily on site using a Ludlum Model 3030E Alpha/Beta sample counter (or equivalent) so that appropriate action can be taken for the following construction day. Data will be stored in the Site database and provided to EPA following data quality review on a weekly basis during the removal action.

4.6 Asbestos Air Sampling

If the removal action activity involves the management of asbestos containing materials, then asbestos air sampling at the project work area will be conducted. Asbestos samples at project work area stations will be collected using a Gillian GilAir 5 sampling pump (or equivalent) operating at a minimum of 2 L/min to draw air through a 25-mm diameter mixed cellulose ester (MCE) fiber filter. Sampling will be conducted on a daily basis during asbestos-related construction activity (anticipated to be up to 10 hours each day). The filters will be sent off-site for laboratory analysis of airborne asbestos fibers.

4.7 Notification Levels

Real-time PM₁₀ monitoring combined with notification levels provides the Construction Manager with a real-time, numerical method of evaluating the effectiveness of fugitive dust control measures and the ability to quickly communicate to the Contractor when fugitive dust measures need to be increased or when construction activities need to be modified to control

dust. Notification Levels for the removal action are provided in Table 4-5 along with the corresponding field responses and personnel notifications. Either of the PM₁₀ or radionuclide notification levels can trigger the response (i.e., they do not have to occur concurrently), as described in the following sections.

Table 4-5. Notification Levels for Evaluating Fugitive Dust Control Effectiveness			
Notification Level	Level 1	Level 2	Level 3
PM ₁₀ Concentration (15-min average)	500 µg/m ³	1,000 µg/m ³	2,500 µg/m ³
Radionuclide Concentration ⁽¹⁾ (4-hr average)	---	---	0.003 pCi/L Gross Alpha 0.51 pCi/L Gross Beta
Contractor Response	Increase fugitive dust control measures	Increase fugitive dust control measures	Stop work temporarily. Increase fugitive dust control measures and/or modify work practices.
Construction Manager Response	Visually monitor real-time meter display to verify PM ₁₀ concentration falls below Level 1	Visually monitor real-time meter display to verify PM ₁₀ concentration falls below Level 1	Meet with Contractor to discuss additional measures and/or modified work practices. Visually monitor real-time meter display to verify PM ₁₀ concentration falls below Level 2.
Personnel Notification	Construction Manager	Construction Manager and On-Site EPA Representative	Constr. Mgr. and On-Site EPA Rep. Approval from Constr. Mgr. and On-Site EPA Rep. required to resume work.

Note: (1) These limits are specific to the 2010 Process Areas Radiological Removal Action. Field measureable limits will need to be determined for each future specific removal action based on known radionuclide ratios applicable to that removal action. This information will be provided as an attachment to this Plan.

4.7.1 PM₁₀ Notification Levels

Although the PM₁₀ Notification Levels are based on a 15-minute average PM₁₀ concentration beginning with 500 µg/m³, the visual/audible alarm system on the real-time PM₁₀ monitors will be programmed for an instantaneous PM₁₀ measurement of 500 µg/m³ to indicate that construction activities may be generating excessive dust in a localized area. Restated, a visual/audible alarm will go off in a localized area soon enough to provide an equipment operator the ability to modify the work practice prior to exceeding Notification Level 1 in a 15-minute period.

If a 15-minute measurement of PM₁₀ equals or exceeds 500 µg/m³ at one or more stations, the Contractor must notify the Construction Manager and implement additional dust control measures so that the following 15-minute measurement of PM₁₀ falls below 500 µg/m³. If a

PM₁₀ measurement equals or exceeds 1,000 µg/m³, the on-site EPA representative will also be notified. If a PM₁₀ measurement equals or exceeds 2,500 µg/m³ at one or more stations, work activity will be suspended until the cause of dust is determined and the appropriate dust control measures are implemented and/or work practices are modified. Approval from the Construction Manager and the on-site EPA representative is required before the Contractor may resume work. As noted in Section 4.1, exceeding Notification Level 3 at one or more project work area stations triggers more frequent high volume PM₁₀ air sampling at the Site perimeter.

4.7.2 Radiological Notification Levels

Since a Ludlum Model 3030E only measures gross alpha and gross beta concentrations, the radionuclide-specific Notification Levels are expressed as 4-hour average gross alpha and gross beta concentrations. Note that the radionuclide-specific Notification Levels were derived using the average radionuclide air concentration limits based on the 2010 Process Areas Radiological Materials Removal Action (see below for additional details). Future removal actions will provide project-specific Notification Levels as an attachment to this Plan. The samples will be analyzed daily and used to evaluate the need for modified dust control measures for the subsequent day. If a 4-hour average gross alpha concentration exceeds 0.003 picoCuries per liter (pCi/L) or gross beta concentration exceeds 0.51 pCi/L (or if future project-specific levels are exceeded), then work activity will be suspended until the cause of dust is determined and the appropriate dust control measures are implemented and/or work practices are modified.

Dust that is generated on-site is expected to contain some radionuclides. Actions taken to limit other hazards associated with PM₁₀ dust will also minimize radiological exposure hazards. The objective of the air monitoring is to limit occupational exposure to less than 500 mrem per year, 1/10th of the applicable Occupational Safety and Health Administration (OSHA) limit of 5 rem per year. Accordingly, airborne radionuclide concentrations will be monitored to ensure they remain below 1/10th of the Derived Air Concentrations (DACs) specified in 10 CFR 20 Appendix B Table 1 Column 3. The site-specific air concentration limits are provided in Table 4-6.

Table 4-6. Radionuclide Air Concentration Limits	
Radionuclide	Air Concentration Limit
Radionuclide Specific Limits	
Ra-226	0.03 pCi/L
Ra-228	0.05 pCi/L
Natural uranium	0.002 pCi/L
Th-232	5E-5 pCi/L
Field Measurable Limits⁽¹⁾	
Gross alpha	0.003 pCi/L
Gross beta	0.51 pCi/L

Note: (1) These limits are specific to the 2010 Process Areas Radiological Removal Action. Field measureable limits will need to be determined for each future specific removal action based on known radionuclide ratios applicable to that removal action. This information will be provided as an attachment to this Plan.

Since a Ludlum Model 3030E only measures gross alpha and gross beta concentrations, the radionuclide-specific air concentration limits in Table 4-6 must be converted to gross alpha and gross beta concentration limits using the average radionuclide concentrations from previous soil sampling applicable to a given removal action.

SECTION 5.0

ANALYTICAL PARAMETERS AND METHODS

This section describes analytical parameters and methods, laboratory reporting limits, and sample hold times for removal action air monitoring which are consistent with the *Quality Assurance Project Plan, Revision 5* (QAPP; ESI and Brown and Caldwell, 2009).

5.1 Analysis of High Volume PM₁₀ Air Sampling Filters

The quartz fiber filters generated from high volume PM₁₀ air sampling will be analyzed off-site at TestAmerica laboratories located in West Sacramento, California and Richland, Washington. The analyte list for high volume PM₁₀ air sampling during a removal action is the same as the revised analyte list used during the 3-year AQM Program and consists of eight metals, five radiochemicals, and sulfate. Table 5-1 summarizes the analytical methods, laboratory reporting limits, and sample hold times for analysis of the quartz fiber filter. Aluminum is analyzed by EPA Method 6010B using ICP⁵ instrumentation. The remaining metals are analyzed by EPA Method 6020 using ICP/MS⁶ instrumentation. Sulfate is analyzed by EPA Method 9056 using ion chromatography. Gas proportional counters are used to analyze gross alpha by EPA Method 900.0 and radium-228 by EPA Method 904.0. Radium-226 is analyzed by EPA Method 903.1 using an alpha scintillation counter. Alpha spectrometry is used to analyze thorium species by HASL 300. The target air sample volume for the PM₁₀ quartz fiber filters are 680 m³ over a 10-hour sample duration. Actual reporting limits achieved for samples from any given monitoring location during any given monitoring event will depend on the actual sample volume collected, which can vary.

⁵ ICP refers to inductively coupled plasma instrumentation

⁶ ICP/MS refers to inductively coupled plasma/mass spectrometry instrumentation

Table 5-1. High Volume PM ₁₀ Analytical Parameters and Methods					
Parameter	Method	Reporting Limit (mass per filter)	Reporting Limit (concentration*)	Sample Hold Time	Sample Media
Aluminum	EPA 6010B	240 µg	0.35 µg/m ³	6 months	8-in x 10-in quartz fiber filter
Arsenic	EPA 6020	3.6 µg	0.0053 µg/m ³	6 months	
Cadmium	EPA 6020	1.2 µg	0.0018 µg/m ³	6 months	
Chromium, Total	EPA 6020	12 µg	0.018 µg/m ³	6 months	
Cobalt	EPA 6020	12 µg	0.018 µg/m ³	6 months	
Copper	EPA 6020	6 µg	0.0088 µg/m ³	6 months	
Manganese	EPA 6020	6 µg	0.0088 µg/m ³	6 months	
Nickel	EPA 6020	6 µg	0.0088 µg/m ³	6 months	
Sulfate	EPA 9056	41 µg	0.060 µg/m ³	28 days	
Alpha, Gross	EPA 900.0	20 pCi	0.029 pCi/m ³	6 months	
Radium-226	EPA 903.1	1 pCi	0.0015 pCi/m ³	6 months	
Radium-228	EPA 904.0	3.1 pCi	0.0046 pCi/m ³	6 months	
Thorium-228	HASL 300	1 pCi	0.0015 pCi/m ³	6 months	
Thorium-230	HASL 300	1 pCi	0.0015 pCi/m ³	6 months	
PM ₁₀	40 CFR Appendix J	100 µg	0.15 µg/m ³	6 months	

*Concentration reporting limits provided are based on a target air sample volume of 680 m³.

5.2 Analysis of Continuous PM₁₀ Monitoring Filters

The Teflon filters generated from the ACCU system for the TEOM unit at AM-6 will be analyzed at Chester Labnet in Tigard, Oregon for the eight metals and sulfate on the revised 3-year AQM Program analyte list. In addition, the Teflon filters will be analyzed for total mass of radium, uranium, and thorium. The metals and radiochemicals will be analyzed by EPA Compendium Method IO 3.3 using XRF⁷ instrumentation. XRF is a non-destructive and sensitive analytical technique for a wide variety of elements. XRF can quantify total radium, uranium, and thorium by weight; however, XRF cannot quantify specific uranium, radium, and thorium isotopes or gross alpha/beta. The radium mass would most likely be radium-226; however, mass contributions from radium-228 may interfere with precise determinations and there is no method to distinguish between the two. The uranium and thorium masses can be treated as uranium-238 and thorium-232. Subsequent to XRF analysis, the Teflon filters will be digested for sulfate analysis by EPA Method 9056 using ion chromatography.

⁷ XRF refers to X-ray fluorescence spectroscopy

Table 5-2 summarizes the analytical parameters and methods, laboratory reporting limits, and sample hold times for continuous particulate air sampling. The target sample volume for Teflon filters is 4,100 liters (or 4.1 m³).

Table 5-2. Continuous PM ₁₀ Analytical Parameters and Methods					
Parameter	Method	Reporting Limit (mass per filter)	Reporting Limit (concentration*)	Sample Hold Time	Sample Media
Aluminum	IO 3.3	0.269 µg	0.066 µg/m ³	6 months	47-mm Teflon filter
Arsenic	IO 3.3	0.009 µg	0.0022 µg/m ³	6 months	
Cadmium	IO 3.3	0.147 µg	0.036 µg/m ³	6 months	
Chromium, Total	IO 3.3	0.024 µg	0.0059 µg/m ³	6 months	
Cobalt	IO 3.3	0.020 µg	0.0049 µg/m ³	6 months	
Copper	IO 3.3	0.028 µg	0.0068 µg/m ³	6 months	
Manganese	IO 3.3	0.082 µg	0.020 µg/m ³	6 months	
Nickel	IO 3.3	0.022 µg	0.0054 µg/m ³	6 months	
Sulfate	EPA 9056	0.750 µg	0.18 µg/m ³	6 months	
Radium, Total	IO 3.3	0.10 µg	0.024 µg/m ³	6 months	
Uranium, Total	IO 3.3	0.10 µg	0.024 µg/m ³	6 months	
Thorium, Total	IO 3.3	0.10 µg	0.024 µg/m ³	6 months	

*Concentration reporting limits provided are based on a target air sample volume of 4.1 m³.

5.3 Analysis of Radiological Monitoring Filters

Radiological filter samples will be analyzed daily on site using a Ludlum Model 3030E Alpha/Beta sample counter so that appropriate action can be taken for the following construction day. The filter samples will be retained for the duration of the removal action for subsequent laboratory analysis in the event additional and more precise data is needed.

5.4 Analysis of Asbestos Air Sampling Filters

The MCE fiber filters will be analyzed off-site at Forensic Analytical Laboratory located in Hayward, California which has accreditation from the American Industrial Hygiene Association (AIHA). The samples will be analyzed for asbestos fiber types by National Institute for Occupational Safety (NIOSH) Method 7402 using Transmission Electron Microscopy (TEM).

SECTION 6.0

QUALITY ASSURANCE PLAN

Quality assurance for the Yerington Mine Site is described in the QAPP (ESI and Brown and Caldwell, 2009). The program incorporates the following items: standard operating procedures (SOPs), equipment calibration and maintenance, independent audit, field and laboratory quality control (QC) samples, data validation, corrective action, and data completeness

6.1 Standard Operating Procedures

Calibration, operation, and maintenance of the air monitoring equipment will be conducted in accordance with the SOPs provided in the QAPP. SOP-10 for calibration, operation, and maintenance of the PM₁₀ high volume air samplers is provided in Appendix B. This SOP includes detailed instructions on sampler operation, digital timer operation, and total sample volume calculations. SOP-15 for calibration, operation, and maintenance of the continuous PM₁₀ monitors is also provided in Appendix B.

6.2 Equipment Calibration

Equipment calibration will be performed in accordance with manufacturer specifications and/or EPA guidance as described below. This section also describes the calibration report that will be included at the completion of the removal action.

- High Volume PM₁₀ Air Samplers: Calibration of the PM₁₀ air sampling equipment will be performed by ARC. The manufacturer recommends the equipment be calibrated according to the following schedule: upon installation; after any motor maintenance; once every 3 months (quarterly); and after 360 sampling hours. The calibration SOP for the PM₁₀ high volume air samplers is provided in Appendix B. The Tisch Environmental, Inc. variable resistance calibration kit is used for the calibration process and includes a variable orifice, National Institute of Standards and Technologies (NIST) traceable calibration certificate, adapter plate, slack tube manometer and tubing. A digital manometer is used in place of the slack tube manometer. In addition to following the calibration procedures specified in the SOPs, the following calibration criteria must be

met: minimum of five calibration points; three calibration points within the allowable variance range (e.g., for PM₁₀, three points must be within 36 to 44 ft³/min); and correlation coefficient greater than 0.990.

- Continuous PM₁₀ Sampling: Calibration of the continuous PM₁₀ monitoring equipment will be performed in accordance with manufacturer recommendations which consist of: flow controller calibration every 3 months (quarterly); mass calibration verification every 12 months (annually); ambient temperature and barometric pressure calibration every 3 months (quarterly); and analog calibration every year (annually).
- Meteorological Equipment: Calibration of the meteorological station(s) was performed at the start of the 3-year AQM Program and continues on a semi-annual basis.
- Real-Time PM₁₀ Meter: Operation and calibration of the real-time PM₁₀ meter will be conducted per the manufacturer (Thermo Electron) specifications. The monitors are calibrated at the factory (or rental distribution center) prior to shipment and will be zeroed prior to each day of operation.
- Radiological Air Sampler: Operation and calibration of the radiological air sampler will be conducted per the manufacturer (F&J Specialty Products) specifications. The samplers are calibrated at the factory prior to shipment and will be annually calibrated thereafter.

6.3 Equipment Maintenance

Maintenance for the high volume PM₁₀ air sampling equipment and meteorological stations will be performed by ARC. Equipment maintenance for the PM₁₀ high volume air samplers is provided in Appendix B and consists of routine maintenance, motor brush replacement, and troubleshooting/corrective action. The manufacturer recommends checking or replacing motor brushes every 300 to 500 hours of operation. Maintenance of the continuous PM₁₀ monitors will be performed as described in Appendix B, and is summarized below:

- Inspect/clean PM₁₀ inlet every 3 months (quarterly);
- Replace large bypass in-line filters every 6 months (semi-annually);
- Clean air inlet system every 12 months (annually);
- Perform leak test every 3 months (quarterly) or after any component in the flow system is replaced; and
- Rebuild sample pump every 18 months.

Meteorological station maintenance is summarized below:

- Wind monitor – replace shaft and propeller bearings semi-annually;
- Pyranometer – routine inspection/cleaning in the field, check level bubble;
- Precipitation gage – routine inspection/cleaning in the field, check level bubble;
- Temperature/RH probe – routine inspection/cleaning in the field;
- Electrical Equipment – keep free of moisture; and
- Batteries – periodically check charge, change when necessary.

6.4 Independent Audit

EPA will conduct quarterly audits on the high volume PM₁₀ air samplers and semi-annual audits on the meteorological station(s). EPA will also perform quarterly audits on the continuous PM₁₀ monitoring equipment. All audits follow EPA guidelines and accuracy criteria.

6.5 Field and Laboratory QC Samples

Field and laboratory QC samples for the AQM program are specified in the QAPP. Field QC samples consist of collocated samples, filter blanks, and field blanks as described below.

- Collocated Samples: analysis of collocated samples (sometimes referred to as duplicate samples for air sampling) is used to check for sampling and analysis error, reproducibility, and homogeneity. A collocated sample will be obtained by collecting a simultaneous sample from the secondary high volume PM₁₀ air sampler collocated with the primary sampler at location AM-1. One collocated sample will be collected per 10 primary samples for the high volume PM₁₀ air sampling only.
- Filter Blanks: analysis of filter blanks (sometimes referred to as trip blanks for air sampling) is used to assess the contamination of samples from the native presence of target analytes in the filters used for air sample collection. A filter blank consists of a clean filter that is transported with associated primary samples, but is never taken out of its protective sleeve. A filter blank will be collected and analyzed for every 20 primary samples.
- Field Blanks: analysis of field blanks is used to assess the possible contamination of samples during sample collection. A field blank consists of a clean filter that is placed onto the air sampler and then taken off without running the sampler. A field blank will be collected and analyzed for every 20 primary samples.

All field QC samples will be submitted blind to the laboratory. Field QC samples will be analyzed for the same parameters specified for the associated primary samples. Laboratory QC samples consist of method blanks, laboratory control samples, and laboratory duplicate samples as specified in the QAPP.

6.6 Data Verification and Validation

The laboratory provides a standard data package for all samples and a comprehensive validation package for 10 percent of all samples. Data verification for 100 percent of all analytical samples will be performed using the standard data package and the criteria provided in the QAPP. Data validation will be performed on 20 percent of all analytical samples per the latest revision of the QAPP. Data verification will be performed on 100 percent of all meteorological data according to the criteria provided in Table 6-1.

Table 6-1. Meteorological Data Validation Criteria	
Variable	Screening Criteria (flag data if the value meets one of the following)
Wind Speed	<ul style="list-style-type: none">▪ Less than zero or greater than 25 meters per second (m/s)▪ Does not vary by more than 0.1 m/s for 3 consecutive hours▪ Does not vary by more than 0.5 m/s for 12 consecutive hours
Wind Direction	<ul style="list-style-type: none">▪ Less than zero or greater than 360°▪ Does not vary by more than 1 degree for more than 3 consecutive hours▪ Does not vary by more than 10 degrees for 18 consecutive hours
Temperature	<ul style="list-style-type: none">▪ Greater than the local record high▪ Less than the local record low▪ Greater than a 10 °C change from the previous hour▪ Does not vary by more than 0.5 °C for 12 consecutive hours
Solar Radiation	<ul style="list-style-type: none">▪ Greater than zero at night▪ Greater than the maximum possible for the date and latitude
Barometric Pressure	<ul style="list-style-type: none">▪ Greater than the local record high▪ Less than the local record low
Humidity	<ul style="list-style-type: none">▪ Less than 30% during precipitation events▪ Varies by 30% of the local average for 24 consecutive hours

6.7 Corrective Action

In the event of error or omission during the execution of this air quality monitoring program, a corrective action procedure is implemented. The procedure begins with prompt notification to

the Project Manager, an investigation into the cause and effect of the incident, implementation of the corrective action, and submittal of a corrective action letter to the EPA. The letter will describe the incident, investigation results and corrective action taken.

6.8 Data Completeness

Program goals for data completeness consist of quarterly valid data retrieval of 90 percent for meteorological data and 80 percent for air quality data. The completeness goal for air quality data is to be tracked for each of the six monitoring locations (i.e., AM-1 through AM-6). If one or more of the high volume PM₁₀ air samplers malfunctions during a sampling event, such that valid data cannot be retrieved, then a makeup run can be conducted if needed to achieve completeness goals.

SECTION 7.0

DATA MANAGEMENT AND REPORTING

This section describes the data management and reporting procedures to be conducted during a removal action.

7.1 Data Management

Data management for the Yerington Mine Site is described in the *Data Management Plan for the Yerington Mine Site* (Brown and Caldwell, 2007) and consists of data acquisition, database management, and data retrieval. Data acquisition during the removal action consists of field data for high volume PM₁₀ air sampling and real-time meters (for PM₁₀, radiological, or asbestos), analytical laboratory results, and continuous measurements from the meteorological stations and continuous PM₁₀ monitors. Data to be acquired from meteorological and continuous PM₁₀ monitoring are summarized in Table 7-1 and Table 7-2, respectively. Information from high volume PM₁₀ air sampling is recorded manually on field data sheets and calibration data sheets and hand-entered into corresponding Microsoft Excel spreadsheets. After the spreadsheets are checked for accuracy, they are used to calculate calibration curves and sample volumes which are loaded into the project database with an automatic data loading program. Analytical results are submitted by laboratories via electronic data deliverable (EDD) files and loaded into the database with an automatic data loading program. The data generated from the meteorological stations and continuous PM₁₀ monitors at AM-1, AM-3, and AM-6 will be transmitted by cellular modem via static IP addresses. Data will be retrieved daily during business days and loaded into the database with automatic data loading programs. Information from radiological air samplers is recorded manually on field data sheets and hand-entered into corresponding Microsoft Excel spreadsheets. After the spreadsheets are checked for accuracy, they are loaded into the project database with an automatic data loading program.

Table 7-1. Meteorological Data Acquisition						
Parameter	Location			Units	Frequency	
	AM-1	AM-3	AM-6		15 min	60 min
Wind direction (resultant mean vector & stand. dev.)	X	X	X	degrees	X	X
Wind speed (scalar avg. & resultant mean vector)	X	X	X	m/s	X	X
Barometric pressure			X	mBar	X	X
Ambient temperature			X	°C	X	X
Relative humidity			X	percent	X	X
Solar radiation			X	kJ/m2	X	X
Precipitation			X	inches	X	X
Aspirated 2-m/10-m temperature			X	°C	X	X

All data are stored in a Microsoft SQL Server relational database which is maintained by the data manager. Data are retrieved and queried with a Microsoft Access graphical user interface. Tables for reporting are generated automatically from the project database.

Table 7-2. Continuous PM ₁₀ Data Acquisition							
Parameter	Location			Units	Freq.	Criteria	Action
	AM-1	AM-3	AM-6				
Continuous PM ₁₀ (hourly & 24-hr running avg.)	X	X	X	µg/m3	60 min	>= 300 @ AM-6	Begin ACCU sample @ AM-6
Status code	X	X	X		60 min	> 0	Check system
Filter loading value	X	X	X	percent	60 min	>= 75	Replace filter
Total mass	X	X	X	µg	60 min		
Main flow rate	X	X	X	L/min	60 min	< 2.9 or < 3.1	Check system
Auxiliary flow rate	X	X	X	L/min	60 min	< 13.6 or > 13.8	Check system
Noise	X	X	X	µg	60 min	>= 0.1	Check system
Frequency	X	X	X	hz	60 min	< 150 or > 400	Check system
Cap temperature	X	X	X	°C	60 min	< 49.9	Check system
TEOM air temperature	X	X	X	°C	60 min	< 49.9	Check system
Ambient temperature	X	X	X	°C	60 min	> 1 difference	Check system
Barometric pressure	X	X	X	atm	60 min	> 0.05 difference	Check system
TEOM date/time	X	X	X		60 min	> 1 min	Check system
Shed temperature	X	X	X	°C	60 min		

7.2 Reporting

Reporting will consist of weekly construction activity summaries during the construction period and a comprehensive data summary report (DSR) following the removal action. The

construction activity summary will typically be provided to the EPA on a Monday in the form of an e-mail with attachments. The e-mail will summarize activities conducted during the previous week including: construction activity, dust control measures implemented, and air monitoring conducted. A Microsoft Excel table will be attached to the e-mail which summarizes meteorological and air monitoring results.

A DSR will be provided that summarizes air monitoring activities, field data, analytical results, and results of calibration/maintenance performed during the removal action. Tables will be used to summarize analytical results by monitoring event and average meteorological conditions by month. Field data sheets, calibration report, analytical laboratory reports and data verification results will be included in the report appendices. The DSR will be submitted to the EPA within three months following the end of the removal action.

SECTION 8.0

REFERENCES

- Brown and Caldwell, 2007, *Data Management Plan for the Yerington Mine Site*. Prepared for the Atlantic Richfield Company. July 26.
- Brown and Caldwell, 2009a, *Conceptual Site Model – Revision 3, Yerington Mine Site, Lyon County, Nevada*. Prepared for the Atlantic Richfield Company. January 30.
- Brown and Caldwell, 2009b, *Air Quality Monitoring Program Data Summary Report – Revision 2, Yerington Mine Site*. Prepared for the Atlantic Richfield Company. September 3.
- EPA, 1998, *Reference Method for the Determination of Particulate Matter as PM-10 in the Atmosphere*. 40 CFR, Chapter I, Appendix J to Part 50. July 1.
- EPA, 2006, *Guidance on Systematic Planning Using the Data Quality Objectives Process*. QA/G 4. Office of Environmental Information, Washington DC. EPA/240/B-06/001.
- ESI and Brown and Caldwell, 2009, *Quality Assurance Project Plan Revision 5, Yerington Mine Site*. Prepared for Atlantic Richfield Company. May 20.
- National Oceanographic and Atmospheric Administration (NOAA), 2010, National Weather Service Hourly Weather Forecast Graph (2 miles W Yerington, NV).
<http://forecast.weather.gov/MapClick.php?CityName=Weed+Heights&state=NV&site=REV&textField1=38.9872&textField2=-119.208&e=0&FcstType=graphical>
- Western Region Climate Center (WRCC), 2007, Yerington, Nevada (269229): NCDC 1971-2000 Monthly Normals. <http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?nv9229>.